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Announcement of Opportunity



SHUTTLE IMAGING RADAR-B

A.O. NO. O SSA-1-82
December 15, 1982

ANNOUNCEMENT OF OPPORTUNITY
SHUTTLE IMAGING RADAR-B

I. DESCRIPTION OF THE OPPORTUNITY

The National Aeronautics and Space Administration (NASA) announces the opportunity to conduct research in the use and development of radar remote sensing techniques for basic and applied studies of the Earth employing the Shuttle Imaging Radar-B (SIR-B). SIR-B will provide the capability to acquire L-band radar imagery of the Earth's surface at selectable incidence angles ranging from 15 to 60 degrees. Section III of this document contains a more detailed description of the SIR-B sensor. The overall SIR-B experiment is being conducted by the Jet Propulsion Laboratory (JPL).

It is currently expected that SIR-B will be launched in August 1984 on the seventeenth flight of the Space Shuttle (also known as STS-17). SIR-B is one of a group of Earth observation experiments that are currently scheduled for flight on STS-17. These experiments are collectively referred to as the OSTA-3 payload (named after NASA's former Office of Space and Terrestrial Applications).

Proposals are sought for geoscientific investigations that utilize SIR-B data for research in geology, hydrology, geography, oceanography, botany, and agronomy. In addition, a limited number of experiments may be selected for sensor technique development and data processing. Two types of proposals will be considered: (1) those requesting NASA funds to support the analysis and interpretation of SIR-B data, and (2) those that require access to SIR-B data but do not require financial support by NASA. The latter type of proposal may be submitted by foreign (non-U.S.) research institutions or by private organizations which could potentially benefit from participating in this type of data analysis activity. It is anticipated that approximately 15-20 proposals will be approved.

This Announcement of Opportunity is being issued to assure the timely selection of investigations and to aid in the detailed planning of the SIR-B experiment. Principal investigators selected in response to the Announcement will be responsible for the definition, planning, and implementation of individual scientific studies to be conducted during the OSTA-3 mission. These investigators will be members of the SIR-B Science Team and they will participate in experiment design, mission support, and data analysis. The Science Team will be headed by the Principal

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Investigator for the overall SIR-B experiment. The experiment Principal Investigator is responsible for the design and fabrication of the SIR-B sensor, management of SIR-B operations during the OSTA-3 mission, reduction of SIR-B data following the mission, and coordination of SIR-B data analysis activities. Dr. Charles Elachi of JPL is the Principal Investigator for the SIR-B experiment.

NASA is currently exploring the possibility of reflighting the Microwave Remote Sensing Experiment (MRSE) in conjunction with the OSTA-3 mission. The MRSE has been developed by the Federal Republic of Germany's Deutsche Forschungs und Versuchsanstalt fur Luft und Raumfahrt (DFVLR) for flight on the Spacelab 1 Shuttle mission. Spacelab 1 is currently scheduled for launch on STS-9 in October 1983. The MRSE is an X-Band radar system which can be operated in an imaging mode to obtain limited surface coverage over an 8.5 kilometer ground swath. Comparison of SIR-B and MRSE imagery could potentially provide new insight into the backscatter response of the Earth's surface at different radar frequencies.

No definite decision concerning the reflight of the MRSE has been made at the present time. Proposals submitted in response to this Announcement will be judged solely on the basis of their relevance to the SIR-B experiment objectives described in Section II. MRSE data analysis activities should not be discussed in these proposals. NASA reserves the right to reallocate data collection times allotted to SIR-B investigations and to alter the scope of approved SIR-B investigations in the event that the MRSE is added to the OSTA-3 mission.

At the present time, NASA plans to archive all SIR-B imagery at the National Space Science Data Center (NSSDC) located in Greenbelt, Maryland. The SIR-B data collection will be made available to the general public through the NSSDC following the OSTA-3 mission. Readers of this Announcement should realize that they do not need to propose a SIR-B science investigation to gain access to the SIR-B data collection.

II. ANNOUNCEMENT OBJECTIVES

To be selected, proposals submitted in response to this Announcement must address one or more of the following experimental objectives:

- o to investigate the effects of surface geometry and composition on radar backscatter as a function of illumination geometry
- o to understand the manner in which microwave radiation is backscattered from multi-layer media such as vegetation-covered soil or sand-covered bedrock
- o to conduct innovative scientific studies of the Earth's resources and its environment employing orbital radar imagery
- o to determine the synergism of radar and visible/infrared imagery for basic and applied studies of the Earth
- o to determine optimum radar illumination geometries for stereoscopic observations of surface topography
- o to conduct microwave technique tests such as sensor calibration, target statistics determination, and radar imaging in spotlight or squint mode
- o to conduct correlation and image processing experiments on SAR data for improved information extraction

III. BACKGROUND

A. MISSION CONTEXT

NASA is engaged in a continuing program of basic and applied research to explore the utility of radar imaging techniques for Earth observations. This program, which began in 1978 with the launch of the Seasat synthetic aperture radar (SAR), continued in 1981 with the Shuttle Imaging Radar-A (SIR-A) mission. Seasat and SIR-A acquired L-band radar imagery at fixed incidence angles of 20 and 47 degrees respectively. Comparison of these images over common areas reveals the important role played by incidence angle in the radar's response to surface geometry and composition.

SIR-B will continue and extend this program by providing the ability to acquire digitally processed imagery at selectable incidence angles between 15 and 60 degrees. Like both Seasat and SIR-A, it will be an L-band (23 cm wavelength), horizontally polarized SAR. However, by mechanically tilting the SIR-B antenna, the angle of incidence can be controlled. This capability, coupled with the ability to provide digitally processed images, will establish an entirely new generation of radar remote sensing studies which emphasize a quantitative multi-parameter approach to radar image analysis. SIR-B will be the first space imaging radar mission which will provide quantitative, calibrated, multiple incidence angle imagery.

In March 1982, NASA established a SIR-B Science Working Group to define the scope of scientific and technique-related experiments that could potentially be conducted with SIR-B. The results of this study have been published as the SIR-B Science Plan, which provides an extensive discussion of geoscientific experiments that are possible with SIR-B, as well as sensor and data processing investigations that are feasible. Copies of the SIR-B Science Plan will be mailed to prospective proposers upon request (see Section V).

B. BASELINE MISSION PLAN

This section presents the current status of OSTA-3 mission plans as of mid-November, 1982. These plans are subject to change and they will be further refined prior to the flight of OSTA-3. The OSTA-3 payload currently consists of SIR-B, the Large Format Camera (LFC), the Feature Identification and Location Experiment (FILE), and the Measurement of Air Pollution from Space (MAPS) experiments. OSTA-3 is scheduled for flight on STS-17 in August, 1984. STS-17 will be launched into a circular orbit inclined 57° with respect to the Earth's equator, and it will remain in orbit for a period of 7-10 days.

The Shuttle's altitude will be approximately 340 km during the first 1-2 days of the mission, followed by a decrease to 230 km for the remainder of the mission. This lower altitude will result in a one-day repeat cycle with a westward drift of 215 km at the equator each day. From one orbit to the next, the ground track will drift westward by 2500 km at the equator. This configuration will enable SIR-B to image a given site on six successive days at six different incidence angles. Approximately 25 hours of SIR-B data will be transmitted to the ground for subsequent digital processing, and 8 hours of data will be optically recorded on the Shuttle for subsequent optical processing.

It is expected that SIR-B imagery will be acquired in both a mapping mode and a multiple incidence angle mode. In the mapping mode, wide-swath coverage (250-300 km) will be obtained by mosaicing contiguous image swaths acquired on successive days, with the antenna depression angle held nearly constant. In the multiple incidence angle mode, narrow-swath coverage (35-50 km) will be obtained at six different angles by changing the antenna depression angle from one day to the next. Proposers should be aware that the antenna depression angle is changed by mechanically rotating the entire structure, and that a quick change in antenna inclination is not possible.

A detailed experiment plan will be assembled after the data requirements of individual scientific investigators have been established and the total time available for data acquisition has been specified.

C. SIR-B SENSOR PERFORMANCE

1. Swath Width and Resolution

The SIR-B swath width will typically range from 35-50 km, depending on the look angle and the signal quantization level. Digital correlation to full resolution will result in imagery with an azimuth resolution of 25m at 4 looks, and a range resolution varying from 55m at a 15 degree incidence angle to 17m at an angle of 60 degrees. Imagery processed in a survey mode immediately following the mission will possess a resolution of approximately 100m in both range and azimuth.

2. Radiometric Calibration

The digitally processed images will be radiometrically calibrated to compensate for drift or changes in transmitter power, receiver gain, antenna pointing, etc. As an example of expected precision of relative radiometric calibration, worst case calibration at a 40 degree look angle would be ± 2.2 dB at the swath edges and ± 0.8 dB at the swath center; the best possible relative calibration is expected to be ± 0.6 dB. These numbers do not include the effects of speckle noise, which alone would produce a backscatter variance of 3 dB for a standard 4-look SIR-B image. This speckle noise can be reduced by spatial integration in the image domain (i.e., subsequent to digital correlation). For example, to meet a ± 0.5 dB relative calibration requirement, a uniform region of about 5-10 resolution cells would be averaged. This will reduce the resolution to about 200-400m.

3. Dynamic Range

The dynamic range of the SIR-B images will depend on (1) the look angle, (2) the number of signal quantization bits, and (3) the position in the swath. As an example, for 6 bit signal quantization and a look angle of 45 degrees, the swath center dynamic range is expected to be 23 dB. At the same look angle and swath position, a 3 bit quantization level would reduce the dynamic range to 16 dB. The maximum dynamic range expected is 35 dB at swath center for a 6 bit quantized signal and a 15 degree look angle.

4. Geometric Calibration

The absolute location accuracy of an image pixel relative to a fixed cartographic grid is limited by uncertainties in spacecraft ephemeris, timing, platform velocity, sensor hardware performance, and ionospheric group delay. The magnitude of the errors in absolute image pixel location for SIR-B will also depend on the antenna look angle. The best case azimuth or along-track geometric location using the precision post-flight ephemeris is predicted to be 60m at 15 degrees and 79m at 60 degrees. The best case range or cross-track geometric location error is predicted to be 212m at 15 degrees and 83m at 60 degrees. These location errors will be larger when only preliminary ephemeris, velocity, and timing data are available.

IV. PROPOSAL OPPORTUNITY PERIOD

All proposals submitted in response to this Announcement are due at NASA Headquarters by the close of business (4:30 PM EST) on March 18, 1983. NASA reserves the right to consider proposals received after this deadline if such an action is judged to be in the interest of the U.S. Government. A complete proposal schedule is given in Section VIII.

V. REQUIREMENTS AND CONSTRAINTS

SIR-B science investigations are scheduled to begin in FY 1984 and to continue through FY 1985 and FY 1986. A total of approximately three million dollars is planned for SIR-B investigations during this three year period. However, these funds are not yet authorized and this Announcement does not constitute an obligation on the part of the U.S. government to provide such funds.

SIR-B data will initially be made available to investigators during the fall and winter of the 1984 calendar year. The 1985 fiscal year will begin on October 1, 1984 and extend through September 30, 1985. Consequently, a major fraction of the expenses associated with a SIR-B science investigation will typically be incurred in FY 1985 and beyond. Activities conducted in FY 1984 will largely be limited to organizing the investigation, collecting ancillary data, and developing computer algorithms and related analysis techniques. In most instances, data analysis activities will begin in earnest in FY 1985. Cost and work plans submitted by a proposer should reflect this transition between preparatory activities in FY 1984 and actual data analysis in FY 1985 and beyond.

All SIR-B data will be digitally processed in a survey mode at a somewhat degraded spatial resolution(see Section III). Data reduced in this fashion will be made available to investigators during the first six months following the mission. Selected portions of the SIR-B data set will subsequently be processed to full resolution and distributed to investigators. Proposals should present a schedule of data analysis activities which is commensurate with this expected availability of data products.

The technical progress and accomplishments of approved SIR-B investigations will be monitored by the Jet Propulsion Laboratory. All selected investigators will be required to submit periodic progress reports to JPL describing the current status of their project, and a final report at the end of the investigation period. Investigators are expected to make available to NASA all techniques, methods of analysis, and results developed over the course of their investigation (see Appendix A for details).

VI. PROPOSAL SUBMISSION INSTRUCTIONS

A. Letter of Intent to Propose

The Program Scientist for the OSTA-3 mission at NASA Headquarters is Dr. Mark Settle. Those interested in proposing an investigation as part of the overall SIR-B experiment should send a Letter notifying NASA of their intent to propose to:

Dr. Mark Settle
c/o Code EPM-20 (Ref. AO-OSSA-1-82)
National Aeronautics and Space Administration
Washington, DC 20546

Ms. Lynn Cline
Shuttle Imaging Radar - B (AO-OSSA-1-82)
International Affairs Division (Code LID-18)
National Aeronautics and Space Administration
Washington, DC 20546
U.S.A. TELEX No. 89530

- o Name, address, and telephone number of the principal investigator
- o Name and address of sponsoring organization; and
- o Specific objectives of the intended investigation

Letters of Intent should be received at NASA Headquarters on or before February 11, 1982. Material in these Letters is for information only, and is not binding on the signatories. Additional information can be obtained from Dr. Mark Settle, at the above address or at telephone number (202)755-2420. All individuals submitting a Letter of Intent will receive a copy of the SIR-B Science Plan.

A uniform proposal format will be required to aid in proposal evaluation and to facilitate comparative analysis. Detailed instructions concerning the scope and organization of SIR-B scientific proposals are presented in Appendix B of this Announcement. All proposals should contain a technical plan describing the technical aspects of the investigation, and a management/cost plan describing how the project will be implemented. Proposal technical plans will be restricted in length to 15 pages of text or less. All proposals must be submitted in English. Foreign proposals must be accompanied by a letter of endorsement from a foreign sponsoring agency (see Appendix B).

Each proposal should identify a single individual who will lead the investigation and serve on the SIR-B Science Team. Individuals who assist a principal scientific investigator in data analysis activities will be considered to be scientific collaborators.

Technical data of a proprietary nature contained in any proposal will be used by NASA for evaluation purposes only. Special procedures described in Appendix A of this document should be used to specify those sections of a proposal that constitute a trade secret under law. It is NASA policy to protect proprietary data and information from public disclosure.

C. Proposal Submission

Fifteen copies of each proposal should be submitted to NASA. Five of these copies should include the management/cost plan and the remaining ten should consist of the technical plan alone. At least one complete copy of the proposal must be signed by an institutional official authorized to certify institutional support, sponsorship of the investigation, and the management and financial aspects of the proposed project. Proposals originating from within the United States should be sent to:

National Aeronautics and Space Administration
Office of Space Science and Applications
Attn: Code EPM-20 (AO No. OSSA-1-82)
Washington, DC 20546

Foreign proposals should be mailed to:

National Aeronautics and Space Administration
International Affairs Division
Attn: Code LID-18 (AO No. OSSA-1-82)
Washington, DC 20546

VII. PROPOSAL EVALUATION, SELECTION, AND IMPLEMENTATION

A. Evaluation and Selection Procedures

Proposals received in response to this Announcement will be reviewed by a technical panel composed of scientists and engineers possessing widely recognized expertise in radar remote sensing and Earth applications research. The purpose of this review is to evaluate the scientific and technical merit of the proposed investigation in relation to the SIR-B opportunity. Those proposals which are considered to have the greatest merit will be further reviewed by the SIR-B experiment team at JPL to determine their technical feasibility and overall compatibility with the OSTA-3 mission plan. An ad hoc subcommittee of the Space Science and Applications Steering Committee will categorize the proposals on the basis of these reviews. Proposals which do not request NASA funds for data analysis activities will be subjected to the same review and evaluation procedures as those proposals requiring financial support.

The procedures, documentation, and results of the proposal evaluation process will be reviewed by the full Space Science and Applications Steering Committee (SSASC). Final decisions concerning the acceptance of individual proposals will be made by the Associate Administrator for Space Science and Applications based upon the recommendations of the SSASC. These decisions will take into consideration the relevance of proposed investigations to ongoing NASA programs, the overall balance between different scientific disciplines, and the availability of funds and mission-related resources.

B. Evaluation Criteria

The fundamental goal of the investigation acquisition process is to identify unique ideas and capabilities which best suit the overall scientific and technological objectives of NASA. The following criteria, listed in descending order of importance, will be used in evaluating individual proposals:

- (1) The relevance of the proposed investigation to the specific opportunity and to the established experiment objectives cited above (Section II).
- (2) The scientific and technological merit of the investigation, including the topical importance of the proposed study within a specific disciplinary field, and the probability of achieving positive results.
- (3) The competence and relevant experience of the principal investigator and any collaborators as an indication of their ability to carry the investigation to a successful conclusion.
- (4) The adequacy and practicality of any plan for acquiring ground-truth, aircraft, or other sources of ancillary data to support the proposed analysis and interpretation of SIR-B imagery.
- (5) The reputation and interest of the investigator's institution, as measured by the willingness of the institution to provide the necessary support to insure that the investigation can be completed satisfactorily.

In addition to the criteria listed above, cost and management factors will be separately considered in all selections. Management aspects include the time and attention the principal investigator plans to devote personally to the investigation. NASA may desire to select only a portion of a proposer's investigation, in which case the investigator will be given the opportunity to accept or decline such partial acceptance.

C. Implementation

Individuals responding to this Announcement will be notified of the outcome of the proposal selection process by NASA Headquarters. It is currently expected that official notifications of acceptance or rejection will be issued in June 1983. Selected investigators will subsequently be contacted by a representative of the Jet Propulsion Laboratory who will be authorized to discuss the specific terms under which the investigation will be implemented.

VIII. SCHEDULE

Letter of Intent to propose due not later than	February 11, 1983
Proposals due at NASA Headquarters by 4:30 PM EST	March 18, 1983
Announcement of Selections	June 1983

The OSTA-3 mission of the Space Shuttle will be one of NASA's major Earth observation flight projects during the mid-1980's. The SIR-B experiment to be conducted during this mission can potentially provide new information concerning the surface characteristics of our planet and new insight into a wide variety of surface phenomena. I invite you to participate in this important and exciting experiment.



B. I. Edelson
Associate Administrator for
Space Science and Applications

APPENDIX A

GENERAL INSTRUCTIONS AND PROVISIONS

I. Instrumentation and/or Ground Equipment

By submitting a proposal, the investigator and his institution agree that NASA has the option to accept all or part of the offeror's plan to provide the instrumentation or ground support equipment required for the investigation. NASA may furnish or obtain such instrumentation or equipment from any other source as determined by the selecting official. NASA reserves the right to require use of Government instrumentation or property to meet the investigative objectives if it is the Government's interests to do so.

II. Tentative Selections, Phased Development, Partial Selections, and Participation with Others

By submitting a proposal, the investigator and his institution agree that NASA has the option to make a tentative selection pending a successful feasibility or definition study of the proposed investigation. Furthermore, NASA has the option to contract in phases for implementation of a proposed investigation, and to discontinue the development of an investigative effort at the completion of any phase. The investigator should also understand that NASA may desire to select only a portion of the proposed investigation. In cases in which two or more proposals address similar topical problems and/or adopt similar approaches to SIR-B data analysis, NASA may desire joint participation on the part of two or more proposers in a single data analysis project. Where joint participation with other investigators is agreed to, a single individual will be designated as the leader or contact point for the investigator group.

III. Foreign Proposals

Proposals for participation by individuals outside the U.S. should be submitted in the same format (excluding cost plans) as U.S. proposals. They should be typewritten and in English.

Foreign proposers must have their proposal reviewed and endorsed by an appropriate foreign governmental agency. Endorsed proposals should be forwarded to NASA to arrive before the deadline indicated under Section IV of the Announcement. A

"Letter of Intent" to propose should be sent directly to the office designated in the Announcement with a copy sent to NASA's Division of International Affairs. All other correspondence (including proposals and endorsements) from foreign proposers and organizations should be sent to:

National Aeronautics and Space Administration
International Affairs Division
Code LID-18 (A.O. No. OSSA-1-82)
Washington, DC 20546
U.S.A.

Foreign proposals will be subject to the same evaluation and selection process applied to proposals originating within the U.S.. Should a foreign proposal be selected, NASA will arrange with the sponsoring foreign agency for the proposed participation on a no-exchange-of-funds basis, in which NASA and the sponsoring agency will each bear the cost of discharging its respective responsibilities including travel and subsistence for its own personnel.

IV. Treatment of Proposal Data

The following will apply in the treatment of proposal data received in response to this Announcement.

A. Commercial and Financial Data

1. It is NASA's policy to use commercial and financial data included in proposals for evaluation purposes only. This policy does not require that this kind of proposal data bear the "Notice" described below.

2. Where it is the practice of an offeror or his proposed subcontractor to treat certain commercial and financial data as a trade secret, and such data is protectible as a trade secret under law, he may apply the "Notice" of paragraph (B) below to those portions to be maintained as a trade secret.

3. In any event, commercial and financial data submitted to NASA in a proposal will be protected to the extent permitted under the law, either as a properly noticed trade secret, or as commercial or financial information received from a person and considered confidential or privileged.

B. Technical Data

It is NASA's policy to use the technical data contained in any proposal submitted in response to this Announcement for evaluation purposes only. Where any such technical data constitutes a trade secret under the law and the offeror, or his potential subcontractor, desires to maintain trade secret rights in such technical data the following "Notice" must be affixed to the cover sheet of the proposal specifying the pages of the proposal which contain trade secrets to be restricted in accordance with the conditions of the "Notice". It is NASA policy to protect technical data labelled in this fashion as a trade secret. NASA assumes no liability for use or disclosure of any proposal technical data to which the "Notice" has not been applied.

NOTICE

Data on page(s) of this proposal constitute a trade secret. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes. In the event a contract is awarded on this proposal the Government may obtain in the contract additional rights to use and disclose this data.

V. Status of Cost Proposals (U.S. Proposals Only)

The investigator's institution agrees that the cost proposal submitted in response to the Announcement is for proposal evaluation and selection purposes, and that following selection and during negotiations leading to a definitive contract, the institution will be required to resubmit or execute a DD Form 633 (Contract Pricing Proposal) as well as submitting all certifications and representations required by law and regulation.

VI. Late Proposals

NASA reserves the right to consider proposals or proposal modifications received after the submission deadline but prior to the date of selection should such an action be in the interest of the U.S. Government.

VII. Disclosure of Proposals Outside the U.S. Government

NASA may wish to obtain assistance outside the U.S. Government in evaluating the technical or scientific aspects of individual

proposals. Special arrangements will be established for the appropriate handling of proposal information by outside reviewers. If the investigator or his institution wish to preclude NASA from employing outside reviewers, the investigator or his institution should so indicate in a covering letter accompanying the proposal. By submitting a proposal without such a letter, the investigator and his institution implicitly agree that NASA may have the proposal reviewed by outside specialists who possess recognized expertise in radar remote sensing and Earth applications research. If a proposer objects to the use of outside experts for purposes of proposal evaluation, NASA may be unable to consider the proposed investigation for inclusion in the overall SIR-B experiment.

VIII. Equal Opportunity (U.S. Proposals Only)

By submitting a proposal, the investigator and his institution agree to accept the below clause in any resulting contract:

EQUAL OPPORTUNITY (JUNE 1973)

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include but not be limited to the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective

bargaining agreement or other contract or understanding, a notice to be provided by the agency Contracting Officer, advising the labor union or workers' representative of the Contractor's commitments under this nondiscrimination clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of Oct. 13, 1967, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and by the rules, regulations, and orders of the Secretary of Labor or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the Equal Opportunity clause of this contract or with any of the said rules, regulations, or orders, this contract may be cancelled, terminated, or suspended, in whole or in part, and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the provisions of Paragraph (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for non-compliance: Provided, however, that in the event the Contractor becomes involved in, or is

threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

IX. Invention and Data Rights

The following provisions concerning invention and data rights will be applicable to any contract resulting from a selection under this Announcement:

(1) In instances where NASA totally or partially funds an investigation under a NASA contract, NASA is required by law to take title to inventions which may result from the work performed under the contract. The contractor would be granted a royalty-free license to practice the invention. The contractor, however, could petition for waiver of such title in accordance with NASA Patent Waiver Regulations 14 C.F.R. 1245.1, whereupon the Agency would give favorable consideration towards waiving title to the invention to the contractor subject to the reservation by the Government of a royalty-free license. As a general rule, the contract provides that NASA and the contractor can use and disclose, without restrictions, the data generated under the contract.

(2) In instances where a joint project is undertaken, i.e., the investigator furnishes the investigation without charge to NASA and no transfer of funds takes place, NASA will obtain a royalty-free license to practice for U.S. Governmental purposes any inventions resulting from the investigation, together with the right to use and disclose the resulting data for U.S. Governmental purposes.

APPENDIX B

GUIDELINES FOR PROPOSAL PREPARATION

The following guidelines apply to the preparation of proposals in response to this Announcement. The proposal format outlined below is merely a guide for the prospective proposer. Strict adherence to these guidelines is not absolutely necessary. However, proposals should provide information related to all items described below and as otherwise specified in this Announcement.

1. COVER LETTER

A letter or cover page should be forwarded with the proposal. It should be signed by the investigator and an official of the investigator's organization who is authorized to commit the organization to the contents and the implementation of the proposal.

2. TABLE OF CONTENTS

The proposal should contain a table of contents.

3. IDENTIFYING INFORMATION

The proposal should contain a short descriptive title for the investigation, the names of all investigators, the name of the organization or institution, the full name of the principal investigator, his address with zip code, and his telephone number.

SECTION I--INVESTIGATION AND TECHNICAL PLAN

1. INVESTIGATION AND TECHNICAL PLAN

The investigation and technical plan generally will contain the following:

a. Summary. A simple, concise statement about the investigation, its conduct, and the anticipated results.

b. Objectives. A brief description of the technical objectives and their relationship to past research efforts and the current state-of-the-art. The scientific rationale for the proposed investigation should be clearly established through

references to existing scientific literature and other publications. The proposed investigation should be defined in relation to the current state-of-the-art in radar remote sensing and/or terrestrial applications of orbital imaging methods. Proposers are encouraged to define explicit hypotheses that will be tested and/or evaluated by the proposed project.

c. Approach. The concept of the investigation should be clearly stated, and the methods to be employed in data analysis and interpretation should be presented. In the case of SIR-B, the data analysis approach adopted in an investigation can generally be classified into one or more of the following categories: (i) the application of proven techniques for analyzing space-acquired data to a new problem or geographical setting, (ii) the extrapolation of conventional methods that have traditionally been employed in aerial image analysis to space-acquired image data, and (iii) the development of new procedures for data reduction and analysis. Proposers should attempt to characterize their intentions with regard to SIR-B data analysis in relation to these categories.

d. Anticipated Results. To the extent that it is feasible, the expected outcome of the proposed project should be presented. The significance of these results should be discussed, if possible, in terms of their scientific significance and implications for future research and development.

The technical plan should not exceed 15 pages of printed text, excluding illustrations, tables, references, bibliographies, and biographical information. Proposals which exceed this restriction in length will be returned to their authors in the interest of fairness to all of the proposers. Proposers who wish to provide evidence of their experience and knowledgability in particular disciplinary fields are encouraged to cite relevant publications they have authored in the general scientific literature. Proposers should not include copies of scientific publications as appendices or addenda to their proposals. Publications of this nature will be returned if they accompany a submitted proposal.

SECTION II--MANAGEMENT PLAN AND COST PLAN

A. MANAGEMENT PLAN

The management plan should summarize the management approach and the facilities and equipment required. Additional guidelines applicable to non-U.S. proposers are contained herein:

1. MANAGEMENT

a. The management plan sets forth the investigator's approach for efficiently managing the work, the recognition of essential management functions, and the effective overall integration of these functions.

b. The management plan gives insight into the organization proposed for the work, including the internal operations and lines of authority with delegations, together with internal interfaces and relationships with NASA, major subcontractors and associated investigators. Likewise the management plan usually reflects various schedules necessary for the logical and timely pursuit of the work, accompanied by a description of the principal investigator's work plan and the responsibilities of the scientific collaborators (if any).

c. The planned participation by small/disadvantaged business in any subcontracting for investigative support functions should be indicated.

2. FACILITIES AND EQUIPMENT

All major facilities and equipment essential to the proposed investigation should be indicated, including those of the investigator's proposed subcontractors and those of NASA and other U.S. Government agencies. Existing equipment should be explicitly differentiated from facilities that will be developed to implement the investigation. Procurement schedules and lead times for the acquisition and installation of new equipment and facilities should also be indicated.

3. ADDITIONAL GUIDELINES APPLICABLE TO NON-U.S. PROPOSERS ONLY

The following guidelines are established for foreign responses to NASA's Announcements of Opportunity. These guidelines indicate the appropriate measures to be taken by foreign proposers, prospective foreign sponsoring agencies, and NASA leading to the selection of a proposal and execution of appropriate arrangements. They include the following:

a. With respect to the "Letter of Intent" to propose, prospective foreign proposers should write directly to the NASA official designated in the Announcement and send a copy of this notice to the Division of International Affairs, Code LID-18, NASA, Washington, DC 20546, U.S.A.

b. Proposals will be submitted in accordance with these NASA "Guidelines for Proposal Preparation". Proposals should be typewritten and in English.

c. Persons planning to submit a proposal should arrange with an appropriate foreign governmental agency for a review and endorsement of the proposed activity. Such endorsement by a foreign organization indicates:

- 1) The proposal merits careful consideration by NASA.
- 2) If the proposal is selected, sufficient funds will be available to undertake the activity envisioned.

d. Proposals (along with the requested number of copies) and letters of endorsement from the foreign governmental agency should be forwarded to NASA in time to arrive before the deadline established for this Announcement of Opportunity. These documents should be sent to:

National Aeronautics and Space Administration
International Affairs Division
Code LID-18 (AO No. OSSA-1-82)
Washington, DC 20546
U.S.A.

e. All proposals should be received before the established closing date; those received after the closing date will be treated in accordance with NASA's provisions for late proposals. Sponsoring agencies may, in exceptional situations, forward a proposal directly to the above address if review and endorsement is not possible before the announced closing date. In such cases, NASA should be advised when a decision on endorsement can be expected.

f. Shortly after the deadline for this Announcement of Opportunity, NASA's Division of International Affairs will advise the appropriate sponsoring agency which proposals have been received and when the selection process should be completed. A copy of this acknowledgement will be provided to each proposer.

g. Successful and unsuccessful proposers will be contacted directly by the NASA Program Office coordinating this Announcement of Opportunity. Copies of these letters will be sent to the sponsoring governmental agency.

h. NASA's Division of International Affairs will then begin making the necessary arrangements to provide for the selectee's participation in the program. Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

- 1) A letter of notification by NASA.
- 2) An exchange of letters between NASA and the sponsoring foreign governmental agency.
- 3) An agreement or Memorandum of Understanding between NASA and the sponsoring foreign governmental agency.

B. COST PLAN (U.S. Investigations Only)

The cost plan should summarize the total investigation cost by major categories of cost as well as by function.

1. COST CATEGORIES

The categories of cost should include the following:

a. Direct Labor. List by labor category, with man-hours and rates for each. Provide actual salaries of all personnel and the percentage of time each individual will devote to the effort.

b. Overhead. Include indirect costs which, because of their incurrence for common or joint objectives, are not readily subject to treatment as a direct cost. Usually this is in the form of a percentage of the direct labor costs.

c. Materials. This should give the total cost of the bill of materials including estimated cost of each major item. Include lead time of critical items.

d. Subcontracts. List those over \$25,000; specify the vendor and the basis for estimated costs. Include any baseline or supporting studies.

e. Special Equipment. Include a list of special equipment and lead and/or development time.

f. Travel. List estimated number of trips, destinations, duration, purpose, number of travelers, and anticipated dates.

g. Other Costs. Cost not covered elsewhere.

h. General and Administrative Expense. This includes the expenses of the institution's general and executive offices and other miscellaneous expenses related to the overall business.

i. Fee (if applicable).

2. COST SCHEDULE

Separate schedules, in the above format, should be attached to show total cost allocable to the following:

a. Principal investigator and scientific collaborator costs.

b. Data reduction and analysis including the amount and cost of computer time.

c. Cost of correlative data (if any) to be acquired by the investigator.

d. Cost of extended field studies in excess of \$3000 to support SIR-B image analysis and interpretation.

END

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